Crystallization of chromium condensed phosphates in the system $CrO_3 – NH_4PO_3$

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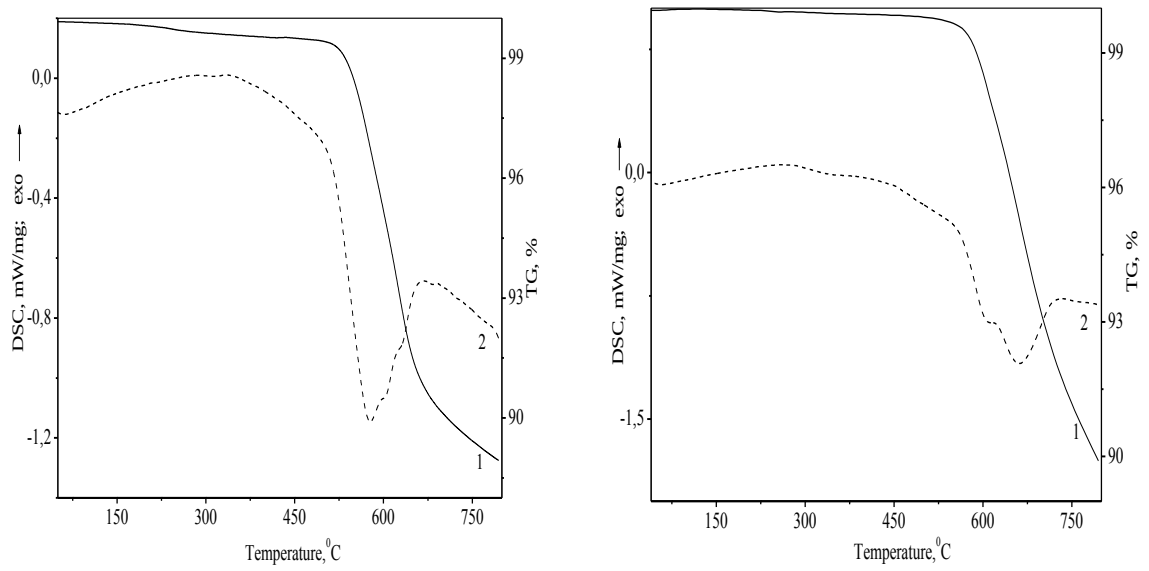
The aim of this work was to study the possibility to obtain double ammonium-containing condensed phosphates in the system CrO_3–NH_4PO_3. Thermal behaviour of the system CrO_3–NH_4PO_3 at the temperatures of 300 and 350 °C and molar ratio of CrO_3 : NH_4PO_3 = 1 : 6, 1 : 12 and 1 : 20 has been investigated. As a result, optimal conditions for synthesis of double ammonium-containing Cr(III) triphosphate $CrNH_4HP_3O_{10}$ (form I), cyclododekaphosphate $Cr_3(NH_4)_3P_{12}O_{36}$, cyclooktaphosphate $Cr_2(NH_4)_2P_8O_{24}$ and polyphosphate $Cr(PO_3)_3$ (form *C*) have been determined. For the first time these compounds were synthesized earlier [1–3]. It has been found that an increase in temperature and/or duration of reaction causes a consecutive crystallization of chromium phosphates in the following order:

$$CrNH_4HP_3O_{10}–I \rightarrow Cr_3(NH_4)_3P_{12}O_{36} \rightarrow Cr_2(NH_4)_2P_8O_{24} \rightarrow Cr(PO_3)_3–C.$$

Formation of other Cr(III) phosphates was not detected during experiment.

Thermal behavior of the compound has been investigated within the temperature range of 30–800°C. It was found that both $Cr_2(NH_4)_2P_8O_{24}$ and $Cr_3(NH_4)_3P_{12}O_{36}$ demonstrate high thermal stability. They decompose at the temperature of about 500 °C.



a) b)

Fig. Curves TG (1) and DSC (2) of $Cr_2(NH_4)_2P_8O_{24}$ (a) and $Cr_3(NH_4)_3P_{12}O_{36}$ (b). Final crystal products of thermal decomposition of the compounds are $Cr(PO_3)_3$–*D* and $Cr(PO_3)_3$–*C*, respectively.

References

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